



PATENT
Attorney Docket No. 401265/FUKAMI

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

YOSHIHIKO TOYODA

Application No. 09/892,603

Art Unit: 2826

Filed: June 28, 2001

Examiner: L. Andujar

For: SEMICONDUCTOR DEVICE

**PENDING CLAIMS AFTER AMENDMENTS
MADE IN RESPONSE TO OFFICE ACTION DATED DECEMBER 13, 2002**

1. A semiconductor device comprising:
an insulating layer having an outside surface and including a plurality of grooves having different widths, each of the grooves including side surfaces and a bottom surface, at least one of the grooves including a plurality of recesses extending entirely within the insulating layer, from the bottom surface of the groove, and into the insulating layer; and
a conductive layer filling each of the grooves and the recesses, the conductive layer including at least a plated layer covering the side surfaces and the bottom surfaces of the grooves and internal surfaces of the recesses.
2. The semiconductor device according to claim 1, wherein the groove including the recesses has a ratio of depth to width of not more than 0.7.
3. The semiconductor device according to claim 1, wherein the groove including the recesses has a ratio of depth to width of not more than 0.35.
4. The semiconductor device according to claim 1, wherein the recesses have a groove shape, with a ratio of depth to width greater than 0.35.
5. The semiconductor device according to claim 1, wherein the recesses have a groove shape, with a ratio of depth to width greater than 0.7.
6. The semiconductor device according to claim 1, wherein the recesses have a shape, with a ratio of depth to width greater than 0.35.

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7. The semiconductor device according to claim 1, wherein the recesses have a hole shape, with a ratio of depth to width greater than 0.7.

8. The semiconductor device according to claim 1, wherein the recesses have two slanting side faces intersecting each other in a cross-sectional view.

9. The semiconductor device according to claim 8, wherein the side faces are slanted with an angle greater than 20 degrees relative to the surface of the insulating layer.

10. The semiconductor device according to claim 1, wherein the recesses have a pitch not more than 4 times a width of the recesses.

13. The semiconductor device according to claim 1, wherein the side surfaces and the bottom surfaces of the grooves are transverse to and parallel to the outside surface of the insulating layer, respectively.